

**Conclusion:** Strong correlations between predicted and achieved mean OAR doses indicates that RapidPlan could accurately predict achievable mean doses, showing the feasibility of using RapidPlan DVH predictions alone for automated individualized HNC plan QA. Since this QA approach does not require the creation of additional plans, these findings indicate that automated individualized plan QA is now a realistic proposition for individual centers and clinical trials.

#### PV-0176

##### Evaluation of biologically effective dose in stereotactic radiotherapy for prostate cancer

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**Purpose or Objective:** Image guided robotic stereotactic radiotherapy (SRT) is becoming increasingly commonly used in the treatment of prostate cancer. As SRT treatment may consist of 100-300 small beams, the dose-rate (DR) and thus the biologically effective dose (BED) can vary significantly within the target volume, despite the creation of a very uniform total physical dose distribution (1). However, the significance of the spatial variations in DR on BED in robotic SRT treatments remains unknown.

The aim of the present study is to measure the DR distribution, with treatment progression, in a representative robotic SRT treatment for prostate cancer and to investigate the effect of these spatial and time related variations in the measured DR on the calculated BED.

**Material and Methods:** A representative robotic SRT treatment plan for prostate cancer (5 x 7.25 Gy, 222 beams, treatment time 28 min) was created with the Multiplan treatment planning software (v 4.6.0., Accuray, USA). Based on this plan a quality assurance plan was calculated for a MultiCube phantom incorporating a MatriXX Detector (32 x 32 matrix of ionization chambers) spatial resolution 7.6 mm, time resolution 0.5 s (IBA Dosimetry, Germany). The DR distributions were measured in four different coronal planes (separated by 1cm) covering the volume of the target structure to create a 3D DR distribution. Then BED values, calculated using bi-exponential repair (repair half times 0.2 h and 2.5 h,  $\alpha/\beta = 1.5\text{Gy}$ ) were calculated for each voxel based on the measured DR (BED\_M), average dose-rate (measured dose divided by the overall treatment time, BED\_A) and physical dose (measured dose without the repair component, BED\_P) distributions.

**Results:** Compared to the BED\_P, where no repair was allowed for, both BED\_M and BED\_A values, within the target volume, were significantly lower (Fig 1). Furthermore, BED\_M values were found to be systematically higher than BED\_A values. Significant variation was observed in BED\_M values corresponding to the same BED\_P value (Fig 1). This effect was not observed with BED\_A values (Fig 1).

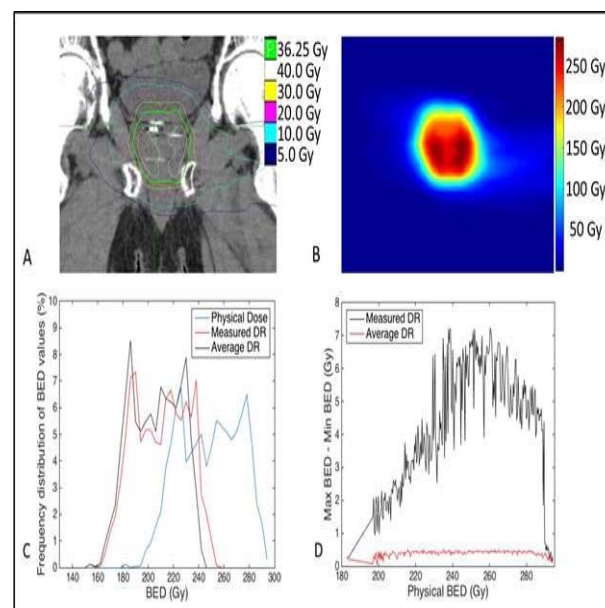


Figure 1. A: Representative SRT plan, B: corresponding BED\_P values, C: Frequency distributions of BED\_P, BED\_M and BED\_A values within the target volume, D: Range of BED\_M or BED\_A values corresponding uniform BED\_P value.

**Conclusion:** The simple use of the average DR in the determination of BED does not take into account the variations in the spatial DR, and this leads to an underestimation of BED values. Furthermore, significant variations were observed in BED\_M values when compared to uniform BED\_P values, an observation also consistent with comparable Gamma Knife treatments (1). Thus, the actual and not the average DR should be used in the calculation of BED when the efficacy of the SRT treatments is evaluated or different treatment modalities are compared.

#### References

1. Millar, W.T., et al., *Physica Medica: Eur. J. Med. Phys.* 31: 627-633, 2015.

#### Honorary Members Lectures:

#### SP-0177

##### Evidence-based education: Radiation Oncology's forgotten foundation?

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Learning Objectives

At the end of this talk you will have a better awareness of:

1. reasons why educational 'science' may be overlooked
  2. how principles of adult learning might apply to radiation oncology
  3. potential benefits of applying an evidence-based approach to educational activities
- Radiation Oncology is a discipline with a history firmly founded on the sciences of radiobiology, radiation physics, anatomy, pathology and clinical medicine that remain as relevant as ever to its exciting future. An evidence-based approach to practice and progress in our field is seen as core to our identity as radiation oncology professionals. So how can it be that the 'science' of teaching the next generation of practitioners, as well as the current one (ourselves), especially in such a rapidly changing arena, is often left to chance? Why is so little focus placed on the